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Hiroimi Sakima

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EXAMINER

CARRILLO, BIBI SHARIDAN

ART UNIT

PAPER NUMBER

1792

NOTIFICATION DATE

DELIVERY MODE

10/18/2007

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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## Office Action Summary

**Application No.**

10/715,859

**Applicant(s)**

SAKIMA, HIROMI

**Examiner**

Sharidan Carrillo

**Art Unit**

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 13-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11, and 13-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities: Page 6 teaches that the flow rate of the etching gas (i.e. **CF4**) to the flow rate of the deposit removing gas (i.e. **oxygen**) is not less than about 0.14% but not larger than about 7.1%. However, it is clearly opposite from page 29 of the specification which teaches that the flow rate ratio of **oxygen** to that of **CF4** is not less 0.14% but not greater than about 7.1%.

Appropriate correction is required.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-5 and 13-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Van Autryve et al (U.S. 6,014,979).

Re claims 1 and 13, Van Autryve teaches a method and apparatus for performing plasma processing, which comprises a chamber 25 for carrying out plasma processing of the substrate; a gas supply system (Fig. 1a) for supplying oxygen (deposit removing gas, as instantly claimed) and CF4 (dummy substrate etching gas, capable of plasma

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etching a dummy substrate); a dummy substrate made of silicon (col. 9, lines 17-18).

The apparatus of Van Autryve is fully capable of performing the first plasma process and the second plasma process, as claimed. Additionally, col. 8, lines 20-25 teach that it is desirable to perform a cleaning process stage between multiple etching cycles.

Therefore, Van Autryve teaches performing multiple etch cycles. Col. 4, lines 5-15 and col. 5, lines 40-60 teaches etching the substrate with a plasma comprising a halogen containing process gas prior to cleaning the chamber.

Re claim 1, the limitations are met since Van Autryve teaches performing multiple etching cycles in between the cleaning stage, wherein the etching cycle employs a plasma (col. 4, lines 5-15). Col. 9, lines 35-40 and col. 10, lines 35-37 teaches that in the cleaning stage, the cleaning gas composition does not leave behind any other residue compositions on the surfaces of the sacrificial collar in the chamber. Col. 8, lines 20-25 teach performing the cleaning stage between "multiple" etching cycles. The limitations of the "second plasma processing step includes a plasma etching performed without producing deposits" are inherently met since the cleaning stage after the first plasma processing step removes all the residue and since Autryve teaches cleaning in between "multiple" etching cycles, thereby implicitly suggesting that the cleaning step does not have to be performed after each etching cycle since no deposits are present, but cleaning after multiple etching cycles. Additionally, the limitations of producing no deposits in the chamber would inherently be met since Autryve is performing the same method steps, using the same gases, as the instantly claimed invention. Re claims 2-5, 14-17, col. 9, lines 16-30 teaches the cleaning stage using a dummy silicon wafer

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and introducing a fluorinated gas (CF<sub>4</sub>) in combination with oxygen. With regard to a ratio of flow rates of gases, applied during the chamber cleaning, as per claim 18 and with regard to a high frequency power, applied during the plasma processing, as per claim 19, it is noted that these limitations do not provide any additional structural element, but recite specific processing parameters established for particular processing and the apparatus of Van Autryve is fully capable of providing and maintaining such parameters. Furthermore, it is well settled that the manner of operating does not differentiate apparatus claim from the prior art if the prior art apparatus teaches all of the structural limitations of the claims, consult *Ex parte* Marsham, 2 USPQ 2-nd 1647 (BPAI 1987). It is also stated that the apparatus claims must be structurally distinguishable from the prior art in terms of structure, not function, consult *In re* Danley, 120 USPQ 528, 531 (CCPA 1959).

4. Claims 13-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Qian et al. (6136211).

Qian teaches a chamber in which a first and second plasma process are carried out (Fig. 3), wherein the second plasma process includes a plasma etching process, the second plasma etch process does not include deposits accumulated in the chamber since in one or more of the etching steps a cleaning gas (CF<sub>4</sub>) is added to the etchant gas (oxygen) to remove etching residue entirely from the etching process (col. 11, lines 20-25, col. 9, lines 15-20). Qian teaches a gas supply system to supply the cleaning and etching gas (Fig.2, elements 200, 70). The etching gas, i.e. would have the capability of etching a dummy substrate (i.e. wafer). Additionally, since the prior art of

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Qian teaches the same etching gas, it would be capable of etching any substrate (i.e. dummy wafer). The claim language of "plasma-etching a dummy substrate during a dry cleaning process carried out by using the dummy substrate after the first plasma process and prior to the second plasma process" is directed to process limitations which do not further structurally define the apparatus. Re claims 14-16, refer to col. 9, lines 10-18. Re claim 17, Qian teaches etching the substrate and cleaning the chamber simultaneously. The semiconductor substrate being etched reads on the limitations of claim 17. Re claim 18, the flow rate ratio is taught by the prior art of Qian. Col. 9, lines 25-30 teaches a volumetric flow ratio of the cleaning gas (i.e. CF<sub>4</sub>) to the etchant gas (oxygen) in the range of 1:20 which reads on 5%, which is within applicant's claimed range. Re claim 19, the limitations of 3.18W/cm<sup>2</sup> to about 4.78W/cm<sup>2</sup> is equivalent to 994-1494 Watts. Col. 7 of Qian teaches an RF voltage between 100 to about 5000 Watts, which falls within applicant's claimed range.

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-5 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al. (6394104).

Chen et al. teach a first plasma etch step (col. 2, lines 28-35) using CF<sub>4</sub>/CHF<sub>3</sub> to planarize a spin on glass layer. After etching the wafers in the etch chamber, polymer builds up in the interior of the chamber (step 44). Step 46 teaches a dry plasma clean process using a dummy silicon wafer (col. 2, lines 60-65) using a deposit removing gas (oxygen) and a etching gas of CF<sub>4</sub> (col. 2-3 bridging). Col. 3, lines 18-22 teaches dry plasma cleaning process removing polymer buildup form the interior of the chamber. Col. 3, lines 14-19, teaches processing "N" lots of production wafers after the plasma dry cleaning process. The limitations of a second processing step are met since the wafers are again processing by a spin on glass etchback using a plasma gas. The limitations of no deposits in the chamber during the second plasma processing step would inherently be met since Chen et al. is performing the same method steps, using the same gases, as the instantly claimed invention. Re claims 2-4, refer to col. 3, lines 1-4. Re claim 5, refer to claim 12 of Chen et al.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Autryve et al (U.S. 6,014,979) in view of Qian et al. (6136211).

Autryve et al. do not teach the claimed flow rate ratio used during the dry cleaning step for removing deposits from the chamber. Autryve teaches the same gases of CF<sub>4</sub> and oxygen.

Qian et al. teach a volumetric flow ratio of the flow rate ratio of the cleaning gas (i.e. CF<sub>4</sub>) to the etchant gas (oxygen) in the range of 1:20 which reads on 5%, which is within applicant's claimed range (col. 9, lines 25-30). The volumetric flow ratio is sufficiently high to react with and remove substantially all the etch residue from the chamber upon completion of the etching process (abstract, col. 4, lines 50-55, col. 9, lines 25-35). It would have been obvious to the skilled artisan to have modified the flow rate of the CF<sub>4</sub> and oxygen gases of Autryve, to include a volumetric flow ratio of 1:20, as taught by Qian et al., for purposes of effectively removing all the etch residue from the chamber. Re claim 7, the limitations of 3.18W/cm<sup>2</sup> to about 4.78W/cm<sup>2</sup> is equivalent to 994-1494 Watts. Both Autryve et al. (col. 9, lines 59-60) and Qian et al. (col. 7, lines 5-10) teach the power level of the RF frequency within applicant's claimed



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range. Additionally, Qian et al. also teach the same 13.56 MHz frequency as taught by applicant's specification. Re claims 8-11, refer to col. 9, lines 15-30 of Autryve.

### ***Response to Arguments***

10. The objection to the abstract is withdrawn in view of applicant's arguments.

11. The rejection of the claims, as being anticipated by Autryve et al. is maintained for the reasons recited above. The rejection of claims 1-5 as being unpatentable over Van Autryve et al. is withdrawn. However, in view of the newly amended claim language, claims 1-5 are now rejected as being anticipated by Autryve et al.

Applicant argues that Van Autryve fails to teach or suggest plasma etching step without producing deposits in the chamber. Applicant's arguments are unpersuasive. Autryve teaches a cleaning step which removes all residues and since Autryve teaches cleaning between "multiple etch cycles", deposits would not be present in the second plasma etching step. Additionally, the limitations are inherently met since Autryve is performing the same method steps using the same gases as the instantly claimed invention.

12. Applicant further argues that the recitation of the function of the claimed apparatus should be given weight. The functional recitation has not been given patentable weight because it is narrative in form. In order to be given patentable weight, a functional recitation must be expressed as a "means" for performing the specified function, as set forth in 35 U.S.C. § 112, 6<sup>th</sup> paragraph, and must be supported by recitation in the claim of sufficient structure to warrant the presence of the functional

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language. *In re Fuller*, 1929 C.D. 172; 388 O.G. 279. It has been held that the term "integral" is sufficiently broad to embrace constructions united by such means as fastening and welding. *In re Hotte*, 177 USPQ 326, 328 (CCPA 1973). Alternatively, even if the functional recitation were given weight, Autryve teaches the claimed invention for the reasons previously recited.

13. The rejections of the claims, as being anticipated and unpatentable over Ma et al. is withdrawn in view of arguments presented by applicant.

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Williams teaches plasma cleaning for removing etch residues. Huang teaches spin on etchback using plasma etch. Bellows teaches purge cycles. Yen et al. teach cleaning of etching apparatus. Soga et al. teach dry etching method. Qiao teaches conditioning a plasma etch chamber. Liu et al. teaches a cleaning process.

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed; and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharidan Carrillo whose telephone number is 571-272-1297. The examiner can normally be reached on M-W 6:30-4:00pm, alternating Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sharidan Carrillo  
Primary Examiner  
Art Unit 1792

bsc



SHARIDAN CARRILLO  
PRIMARY EXAMINER